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EXAMINER

CALANDRA, ANTHONY J

ART UNIT

PAPER NUMBER

1791

MAIL DATE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/583,339	<b>Applicant(s)</b> BUCHERT ET AL.	
	<b>Examiner</b> ANTHONY J. CALANDRA	<b>Art Unit</b> 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 March 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☒ Claim(s) 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/9/09</u> .  | 6) <input type="checkbox"/> Other: _____                          |

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***Detailed Office Action***

The communication dated 3/9/2009 has been entered and fully considered.

Claims 1, 10, 11, 17, 18, and 21 have been amended. Claims 23 and 24 are new. Claims 1-24 are pending.

***Terminal Disclaimer***

The terminal disclaimer filed on 3/9/2009 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of the 10/583712, 10/583849, and 10/583711 applications has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Response to Arguments***

Foreign priority has been acknowledged (see above and action summary sheet).

***Double Patenting***

In light of the filing of a terminal disclaimer the ODP rejections have been withdrawn.

***112 and 101 rejections***

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In light of argument and amendment the 112 1<sup>st</sup> /2<sup>nd</sup> and 101 rejections towards claim 21 has been withdrawn.

In light if amendment the rejections towards claims 7, 10, 11, and 18 have been withdrawn.

***The applicant traverses the examiner's rejection of claim 17 arguing that 0.0001 to 10 mg protein/g dry matter is a separate range from the enzyme dosage and therefore is not narrower range of enzyme dosage (1-100,000 nkat/g of pulp).***

Both ranges measure the amount of enzyme on pulp. If the activity of the enzyme is known, for instance, 1 mg of enzyme is equivalent to 100 nkat. This would then allow the conversion of 1-100,000 nkat/g of pulp to 0.01-1,000 mg protein/g pulp which is a different range. However, the examiner agrees with the applicant's point that the person of ordinary skill in the art may want to limit both ranges as independent variables (i.e. there are enzyme strengths that the applicant can exclude using both of the above limitations), hence, the examiner has withdrawn the argument to there being a broad/narrow range.

The examiner has not withdrawn the rejection to claim 17 based the value nkat/g. The applicant still gives an undefined explanation for how this is calculated. The applicant states that "Also the conditions for determining enzyme activity are described in the working examples (see e.g., Examples 4-6). Thus, the specification provides sufficient information for determining the conditions at which enzyme activity is measured".

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This is in contrast to an art such as PEDERSEN which specifically describes how to calculate the laccase enzyme activity in the publication:

"(37) Laccase activity as defined herein is determined on the basis of spectrophotometric measurements of the oxidation of syringaldazin under aerobic conditions. The intensity of the violet colour produced in the oxidation reaction is measured at 530 nm.

(38) The analytical conditions are: 19 .mu.M syringaldazin, 23.2 mM acetate buffer, pH 5.5, 30.degree. C., reaction time 1 minute, shaking. 1 laccase unit (LACU) is the amount of enzyme that catalyses the conversion of 1 .mu.M of syringaldazin per minute under these conditions".

In contrast the instant specification gives no applicable temperature or pH. The applicant's explanation in the arguments does not clear up the deficiencies as the arguments state that the activity value is based off of each experimental pH/temperature combination. In general activity values are measured in comparison to a standard set of assay conditions not a set of conditions which changes based on variable temperatures/pH's [see e.g. Units of Enzyme Activity pg. 319 #1]. Since the Applicant gives variable temperatures/pHs that can be used, the definition of nkat/g is also necessarily variable and indefinite.

Therefore when PEDERSEN when gives a specific point of 3 LACU/g which equals 50 nkat/g (1U = 16.67 nkat [see e.g. Units of Enzyme Activity pg. 320 #5]) and falls with the instant claimed ranges of claims 17 and 24 the examiner cannot be sure if the teaching of PEDERSEN anticipates/makes obvious said ranges.

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*Art Rejections*

PEDERSEN in view of BETREMIEUX

***Applicant argues that the examiners' reasoning is based on hindsight analysis.***

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

***Applicant argues that PEDERSEN increases a property already present in the fiber wherein the invention creates properties which are alien to the fibers such as hydrophobicity.***

The instant claims, unlike the copending application claims, do not state that the properties of the fibers must be foreign to the fibers. PEDERSEN attaches ferulic acid (the modifying agent) to the fibers. In the specification it is stated that [pg. 8] ferulic acid derivatives as an example of a compound that has a hydrophobic chain.

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PEDERSEN specifically states that the Ferulic acid can have alkyl substituents, the alkyl substituents are hydrophobic groups [column 5 lines 13-20]. The claims only require a hydrophobic group to be present.

*Applicant argues that while BETREMIEUX is related to bonding to fibers the person of ordinary skill in that art would not be motivated combine the polymers of BETREMIEUX with that of PEDERSEN as there are different reactions.*

PEDERSEN increases the anionic charge of the fibers. BETREMIEUX discloses that paper fibers are anionic and that anionic fibers do not attract other anionic components well, therefore cationic components would be attracted to the fibers [column 1 line 65 – column 2 line 7]. As PEDERSEN teaches a fiber which has had its fiber anionic charge increased the fiber would be expected to also be able to have a cationic polymer such as BETREMIEUX to be better attached to the fiber. The person of ordinary skill in the art has clear motivation to add a sizing compound to the paper.

**Applicant further argues that the maleic hydroxide of BETREMIUEX attaches non-specifically the hydroxyl groups.**

The applicant does not claim how the attachment of polymer occurs on the fiber. Additionally the addition of ferulic acid derivatives increases surface charge and hydroxyl groups (on the carboxylic acid chain) and thus is compatible with the fiber of PEDERSEN.

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***Applicant argues that BETREMIEUX is related to a non-specific method of bonding while the instant invention is based on a highly specific enzymatic way of making fibers suitable to bonding.***

The examiner has rejected the claims based on claim language. The instant claim language does not limit how the polymer is bonded to the fibers.

***Applicant argues that the claims have been amended to state that the polymer was either thermoplastic or thermosetting and therefore the rejections based on BETREMIEUX should be withdrawn.***

The examiner agrees that BETREMIEUX does not state thermosetting or thermoplastic polymers therefore the examiner has withdrawn the rejection.

***Applicant argues that PEDERSEN and BETREMIEUX teach writing papers.***

The applicant has given no reason why 'writing papers' teach away from the present invention. Further, there is no claim language that prevents writing papers.

***Applicant states that the combination with CALL is improper as CALL does not disclose that the mediators stick to the fibers.***

CALL does state that radical reactions occur. CALL further discloses phenolic compounds which act as mediators. It would be reasonable to expect that similar compounds such as those taught by CALL and PEDERSEN would both bind to the fiber. Notwithstanding this, CALL is only used as a backup rejection to PEDERSEN as PEDERSEN suggests phenolic



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derivatives of benzoic acid including hydroxybenzoic acid [column 5 lines 31-33]. PEDERSEN further discloses that the phenolic ring can have one or more hydroxyl substituents on the phenol ring. Gallate is a hydroxybenzoic acid with 3 hydroxyl substituents on the phenol group. As PEDERSEN discloses the genus hydroxybenzoic acid (at least 1 hydroxyl) and discloses that the phenol ring can have 1 or more hydroxyl groups it is the examiner position that it would be obvious to try the species of 3 hydroxyl groups (gallic acid) as there are a limited number of hydroxyl groups that can be placed on a hydroxybenzoic acid (1-5 hydroxyl groups). Upon a further reading of the reference not only is the compound obvious but it is also specifically mentioned by PEDERSEN.

As such the examiner has withdrawn the CALL rejections as repetitive and cumulative.

### ***Claim Objections***

Claim 15 is objected to because of the following informalities: Claim 15 should be dependent on claim 12 where the enzyme is first mentioned. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Applicant amended the claims to claim thermosetting and thermoplastic hydrophobic polymers in the preamble. However, the applicant does not retain this limitation in the body of the claim. Therefore it is not clear if the hydrophobic polymers of the preamble are the same as the hydrophobic polymers of the body of the claim.

For the purpose of examination the examiner has treated the hydrophobic polymers of the body of the claim as thermosetting/thermoplastic polymers even though this limitation is missing.

Claims 2-24 are dependent on claim 1.

Claims 17 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 17 and 24 are rejected based on the indefinite definition of nkat/g. The applicant still gives an undefined explanation for how this is calculated. The applicant states that "Also the conditions for determining enzyme activity are described in the working examples (see e.g., Examples 4-6). Thus, the specification provides sufficient information for determining the conditions at which enzyme activity is measured".

This is in contrast to an art such as PEDERSEN which specifically describes how to calculate the laccase enzyme activity in the publication:

*"(37) Laccase activity as defined herein is determined on the basis of spectrophotometric measurements of the oxidation of syringaldazin under aerobic conditions. The intensity of the violet colour produced in the oxidation reaction is measured at 530 nm.*

*(38) The analytical conditions are: 19 .mu.M syringaldazin, 23.2 mM acetate buffer, pH 5.5, 30.degree. C., reaction time 1*

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*minute, shaking. 1 laccase unit (LACU) is the amount of enzyme that catalyses the conversion of 1 .mu.M of syringaldazin per minute under these conditions".*

In contrast the instant specification gives no applicable temperature or pH. The applicant's explanation in the arguments does not clear up the deficiencies as the arguments state that the activity value is based off of each experimental pH/temperature combination. In general activity values are measured in comparison to a standard set of assay conditions not a set of conditions which changes based on variable temperatures/pH's [see e.g. Units of Enzyme Activity pg. 319 #1]. Since the Applicant gives variable temperatures/pHs that can be used, the definition of nkat/g is also necessarily variable and indefinite.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1-24 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,187,136 PEDERSEN et al., hereinafter PEDERSEN in view of U.S. Publication 2002/0096282 LEIBLER et al., hereinafter LEIBLER.

As for claim 1, PEDERSEN discloses activating fibers with an oxidizing agent capable of activating the phenolic groups [abstract, column 8 lines 25-37]. PEDERSEN further discloses attaching to the oxidized sites a modifying agent such as Ferulic acid [column 5 lines 20-36 and column 8 lines 55-60]. PEDERSEN specifically states that the Ferulic acid can have alkyl substituents, the alkyl substituents are hydrophobic groups [column 5 lines 13-20]. The claims only require a hydrophobic group. PEDERSEN discloses that modified lignocellulose has a higher electronegative charge [column 8 line 63- column 9 lines 3 and column 10 lines 55-60] and this higher negative charge allows cationic (positively charged) polymers to bind to the more negatively charged pulp more effectively. PEDERSEN discloses cationic wet strength agents such as cationic starch and cationic polyacrylates [column 9 lines 4-9]. PEDERSEN discloses that by performing this treatment the lignocellulose is able to retain a larger amount of the

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cationic polymer while using less of the cationic polymer [column 3 lines 25-32]. PEDERSEN discloses strengthening agents but does not disclose hydrophobic wet-strength polymers that are thermosetting or thermoplastics.

LEIBLER discloses treating paper with cationic (positive charge) resin PAE mixed with a dispersion of thermoplastic polymers [abstract, claim 24 and 0020]. At the time of the invention it would have been obvious to the person of ordinary skill in the art to substitute the wet-strength composition of LEIBLER for the wet-strength composition of PEDERSEN. The person of ordinary skill in the art would be motivated to do so to since the composition of LEIBLER allows for high addition of wet strength needed for certain classes of paper types [0002] and the mixture of LEIBLER gives a high wet strength as compared to PAE alone [0092-0093]. Additionally the person of ordinary skill in the art would expect enhanced compatibility with PEDERSEN as LEIBLER states that low negative charges limit PAE addition, however, PEDERSEN increases negative charge thus enhanced compatibility would be expected [0008].

As for claim 2, 3, 12, and 13, PEDERSEN discloses the reaction of fiber with an enzyme capably of catalyzing oxidation of phenolic structures [column 8 lines 25-30]. An enzyme is a type organic catalyst. PEDERSEN discloses the modifying agent of Ferulic acid which is grafted onto the pulp [column 10 lines 60-65]. Ferulic acid is a chemical which is capable of providing the lignocellulose fiber material with properties reducing the susceptibility to yellowing. PEDERSEN discloses that the enzymatic oxidation process occurs together and that the Ferulic acid is grafted onto the material, therefore the modifying agent is activated [column 8 lines 15-25 and column 10 lines 60-65].

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As for claim 4 and 14, PEDERSEN discloses the range of 0.1 to 40% consistency [column 5 line 5-7] encompassed by the instant claimed range.

As for claim 5-9, and 23, PEDERSEN discloses that Ferulic acid, the modifying agent, is grafted onto the material, [column 10 lines 60-65]. Ferulic acid is an unsaturated carboxylic acid with a chain of over 2 carbon atoms that has a carboxyl functional group, a phenolic group and a hydroxyl functional group. PEDERSEN additionally teaches that the Ferulic acid can have alkoxy substituents such as methyl, ethoxy and propoxy groups with have 1, 2, and 3 carbon atoms in the chain, respectively [column 5 lines 13-20].

As for claim 10, PEDERSEN discloses phenolic derivatives of benzoic acid including hydroxybenzoic acid [column 5 lines 31-33]. PEDERSEN further discloses that the phenolic ring can have one or more hydroxyl substituents on the phenol ring. Gallate is a hydroxybenzoic acid with 3 hydroxyl substituents on the phenol group. As PEDERSEN discloses the genus hydroxybenzoic acid (at least 1 hydroxyl) and discloses that the phenol ring can have 1 or more hydroxyl groups it is the examiner position that it would be obvious to try the species of 3 hydroxyl groups (gallic acid) as there are a limited number of hydroxyl groups that can be placed on a hydroxybenzoic acid (1-5 hydroxyl groups). Additionally, PEDERSEN specifically discloses the species of 4-hydroxy-3-5dimethoxybenzoic acid. This is a derivative of gallic acid with substituted alkyl groups on the original 3 and 5 hydroxyl group [column 5 lines 35-36].

As for claim 11, PEDERSEN discloses that the Ferulic acid is added as a solution which the examiner has interpreted as a disperse system, or dispersion [column 10 lines 25-30].

As for claim 15 and 16, PEDERSEN discloses laccase, oxidases and peroxidases [column 6 lines 1-36].

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As for claim 17 and 24, PEDERSEN discloses 0.0001 – 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant.

PEDERSEN discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an LACU is measured under disclosed conditions [column 6 lines 55-60]. PEDERSEN additionally gives a specific point of 3 LACU/g which equals 50 nkat/g (1U = 16.67 nkat [see e.g. Units of Enzyme Activity pg. 320 #5]) and falls with the instant claimed ranges of claims 17 and 24. Until shown otherwise the examiner has interpreted these ranges to overlap/fall within with the instant claimed ranges [since the applicant fails to define the units].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables]. PEDERSEN clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

As for claim 18 and 20, PEDERSEN discloses hydrogen peroxide [column 8 lines 4-10].

As for claim 19, PEDERSEN discloses oxygen and oxygen containing gases [column 7 line 65 to column 8 line 3].

As for claim 21, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least

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some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

As for claim 22, PEDERSEN discloses that the reaction can take place simultaneously or sequentially [column 4 lines 10-35].

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY J. CALANDRA whose telephone number is (571) 270-5124. The examiner can normally be reached on Monday through Thursday, 7:30 AM-5:00 PM.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anthony J Calandra/  
Examiner, Art Unit 1791

/Eric Hug/  
Primary Examiner, Art Unit 1791